Use $\log_2 3 \approx 1.5850$ and $\log_2 5 \approx 2.3219$ to approximate the value of each expression.

1. $\log_2 25$ $\log_2 5+\log_2 5$

$= 4.6438$

2. $\log_2 27$ $\log_2 3^3 = 3\log_2 3$

$= 4.755$

3. $\log_2 \frac{3}{5}$ $= \log_2 3 - \log_2 5$

$=$

4. $\log_2 \frac{5}{3} = \log_2 5 - \log_2 3$

$=$

5. $\log_2 15$ $\log_2 3+\log_2 5$

$=$

6. $\log_2 45$ $\log_2 3^2+\log_2 5$

$= 2\log_2 3+\log_2 5=$

7. $\log_2 75$ $\log_2 5^2+\log_2 3$

$2\log_2 5+\log_2 3=$

8. $\log_2 0.6$ $\log_2 3-\log_2 5$

$=$

9. $\log_2 \frac{1}{3}$ $\log_2 3^{-1} = -1\log_2 3$

10. $\log_2 \frac{9}{5}$ $\log_2 3^2-\log_2 5$

$2\log_2 3-\log_2 5$

11. $\log_{10} 27 = 3 \log_{10} x$

$\log_{10} 27 = \log_{10} x^3$

$27 = x^3$

$x = 3$

12. $3 \log_7 4 = 2 \log_7 b$

$(4^3)^{\frac{1}{2}} = (b^2)^{\frac{1}{2}}$

$4^{3/2} = b$

$b = 8$

$4 \boxed{\wedge} (3/2)$

$\boxed{x^y}$

13. $\log_4 5 + \log_4 x = \log_4 60$

$5x = 60$

$x = 12$

14. $\log_6 2c + \log_6 8 = \log_6 80$

$16c = 80$

$c = 5$

15. $\log_5 y - \log_5 8 = \log_5 1$

$\frac{y}{8} = 1$

$y = 8$

16. $\log_2 q - \log_2 3 = \log_2 7$

$\frac{q}{3} = 7$

$q = 21$

17. $\log_9 4 + 2\log_9 5 = \log_9 w$

$4 \cdot 25 = w$

$w = 100$

18. $3\log_8 2 - \log_8 4 = \log_8 b$

$\frac{8}{4} = b$

$2 = b$

19. $\log_{10} x + \log_{10}(3x - 5) = \log_{10} 2$

$x(3x-5) = 2$

$3x^2 - 5x = 2$

$3x^2 - 5x - 2 = 0$

$\frac{5 \pm \sqrt{25 - 4(3)(-2)}}{6}$

$= \frac{5 \pm \sqrt{49}}{6} = \frac{5 \pm 7}{6}$

$= 2$ or $\frac{-1}{6}$

20. $\log_4 x + \log_4(2x - 3) = \log_4 2$

$x(2x-3) = 2$

$2x^2 - 3x = 2$

$2x^2 - 3x - 2 = 0$

$(2x+1)(x-2) = 0$

$x = -1/2$ or 2

21. $\log_3 d + \log_3 3 = 3$

$3d = 3$

$d = 1$

22. $\log_{10} y - \log_{10} (2 - y) = 0$

$(2-y) \cdot \frac{y}{2-y} = 0 \cdot (2-y)$

$y = 0$

23. $\log_2 s + 2 \log_2 5 = 0$

$5 \cdot 25 = 0$

$s = 0$

24. $\log_2 (x + 4) - \log_2 (x - 3) = 3$

$\frac{x+4}{x-3} = 3$

$x + 4 = 3x - 9$

$13 = 2x$

$6.5 = x$

25. $\log_4 (n + 1) - \log_4 (n - 2) = 1$

$$\frac{n+1}{n-2} = 1$$

$$n + 1 = n - 2$$

$$1 = -2$$

no solution

26. $\log_5 10 + \log_5 12 = 3 \log_5 2 + \log_5 a$

$$10 \cdot 12 = 2^3 \cdot a$$

$$120 = 8a$$

$$15 = a$$

More rules for logarithms
ln x means $\log_e x$ (ln is natural log)

exponents	logarithms
(All laws apply for any positive a, b, x, and y.)	
$x = b^y$ is the same as	$y = \log_b x$
$b^0 = 1$	$\log_b 1 = 0$
$b^1 = b$	$\log_b b = 1$
$b^{(\log_b x)} = x$	$\log_b b^x = x$
$b^x \, b^y = b^{x+y}$	$\log_b(xy) = \log_b x + \log_b y$
$b^x \div b^y = b^{x-y}$	$\log_b(x/y) = \log_b x - \log_b y$
$(b^x)^y = b^{xy}$	$\log_b(x^y) = y \log_b x$
	$(\log_a b)\,(\log_b x) = \log_a x$
	$\log_b x = (\log_a x) / (\log_a b)$
	$\log_b a = 1 / (\log_a b)$

$5^{x+1} = 625$

$\log_5 5^{x+1} = \log_5 625$

$x + 1 = \log_5 625$

$x + 1 = 4$

$-1 \quad -1$

$x = 3$

$2^{x-4} = 3$

$\log_2 2^{x-4} = \log_2 3$

$x - 4 = \log_2 3$

$x - 4 = 1.58$

$+4 \quad +4$

$x = 5.58$

$\log_5(2x + 3) = 3$

$b^{(\log_b x)} = x$

$5^{\log_5(2x+3)} = 5^3$

$2x + 3 = 125$

$-3 \quad -3$

$2x = 122$

$x = 61$

$\log_4(3x - 5) = 0$

$4^{\log_4(3x-5)} = 4^0$

$3x - 5 = 1$

$+5 \quad +5$

$3x = 6$

$x = 2$